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(54) Front mounted gate valve

An der Vorderseite montiertes Anschnittventil

Valve pour entrée d'injection montée frontalement

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(73) Proprietor: HUSKY INJECTION MOLDING SYSTEMS LTD.
Bolton Ontario L7E 5S5 (CA)

(72) Inventors:
- Gessner, Dieter
D-6367 Karben (DE)
- Osterode, Martin
D-65594 Runsel (DE)

(74) Representative:
Patentanwälte Breiter + Wiedmer AG
Seuzachstrasse 2
Postfach 366
8413 Neftenbach/Zürich (CH)

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Description

BACKGROUND OF THE INVENTION

[0001] This invention relates to hot runner valves, and more particularly, to hot runner valves designed for cooling the motive mechanism thereof during the operation of the valve.

[0002] Hot runner systems can be categorized into two types with respect to the method of closing off the mold cavity injection gate. These types include a thermally closed gate and a mechanically closed gate. This invention relates to mechanical or valve gate closing mechanisms for use in multi-cavity or high cavitation molds and molding systems as well as single cavity molds. Typically, a valve gated actuating mechanism is a unitized device which is attached to a valve stem or other commonly known gate closing component. Accordingly, valve stem actuation devices typically consume a considerable amount of space within a mold platen. As a result of such large space consumption, molds are formed which are too large for typical injection molding machines, resulting in increased expense due to the necessity to use larger and more materials for producing a larger mold to accommodate the mechanism.

[0003] Such a scenario typically arises when a valve gated hot runner system is desired for a multi-level or stack mold. Most valve gated actuation mechanisms assume a large space which would be better used for an opposing injection nozzle housing arrangement. Such is the case for typical mechanically actuated closed gate mechanisms and typical thermally activated closed gate mechanisms. In comparing two such mechanisms, it is obvious that the mechanically closed gate is generally significantly larger than the thermally closed gate. Accordingly, it would be beneficial in the art to design a mechanically actuated closed gate system of a size comparable to thermally closed gate systems.

[0004] German patent 1,133,880 shows a nozzle suitable for attachment to the end of an injection molding machine extruder. The actuating mechanism used to move the valve stem in reciprocating fashion is shown as an annular piston, where a pressurized fluid is employed as the motive force. As with all piston type actuators, it is necessary to provide resilient seals which serve to prevent pressure leak from the pressurized chambers on both sides of piston, so that maximum force is transferred to the piston. Additionally, pressurized fluid leakage can lead to, wasting energy or fluid substance; creating undesirable noise; fire hazards; and undesirable cooling effects on the hot melt conveying components adjacent to it. The resilient seals for this nozzle design must be of very high temperature capability.

[0005] Plastic conveying equipment, such as that described in the German patent, often needs to operate at temperatures well over 260°C (500°F). Resilient seals which can survive in such an environment for desirable periods of time are either unavailable or require that a more complex, multiple-piece piston design be used. Additionally, such seals are prohibitively expensive and will not provide a 100% seal over extended periods of time. Although the German patent does not show or describe the method of piston sealing, it is presumed that it suffers from the sealing/leaking problems as discussed above.

[0006] U.S. Patent No. 4,082,226 shows another gate valve actuating mechanism. An annular piston of complex and bulky design is used, which includes many parts requiring high manufacturing expense and laborious assembly time. By necessity, the piston seals must withstand very high temperature to provide prolonged service next to the hot medial portion of the nozzle. The very bulky piston design, because of its ratio of height to diameter, is prone to cocking and jamming should one of the piston posts 50 show resistance to slide due to sticking or friction. Also, as seen in FIG. 7 of the patent, the valve stem 66 must hit the outlet bore 71 to stop travel of the stem. Such contact can lead to undesirable wear and possibly the damage of the bore and front nozzle portion.

[0007] U.S. Patent No. 4,443,178 shows a compact method of actuating a valve stem using a spring, as shown in FIG. 8. However, this method relies on plastic pressure to push the valve stem back and the spring pressure is not readily adjustable with respect to force or time desired of the stem to close the gate. A pressurized piston is far superior in its ability to readily vary stem force as well as permit actuation of the stem while pressure still exists in the system or delay closing of the stem even after pressure has been released.

[0008] U.S. Patent No. 4,832,593 shows a design similar to the aforementioned patent, but where the motive means, in this case an air piston, is not annular in shape. The piston is solid and is positioned on the center axis and directly behind the nozzle housing. Because the piston resides within the heated body used to convey plastic melt to the nozzle housing, it requires a cast iron piston ring as a sealing device to withstand the high temperatures. Such metal-on-metal dynamic seals inherently do not provide 100% sealing efficiency and thereby are not capable of allowing maximum supply pressure to act on the piston face. Also, it can be seen from FIG. 1 that the nozzle body is necessarily much larger in diameter than the nozzle itself and the axial length of the nozzle and nozzle body together is extended, due to the internal space required to provide the piston assembly.

[0009] EP-A-0 449 452 and EP-A-0 086 963 disclose mechanically actuated valve gated injection molding systems comprising a reciprocal valve stem positioned within a housing.

[0010] All of the above cited patents are not adaptable for use inside an injection mold frame, especially in a mold where molding cavity spacing is dense, so as to maximize production output from the molding tool. Nor do they permit the design of a multi-level or stack mold

with a minimum mold open distance, compatible with standard injection machines. Also, the prior art does not disclose an appropriate piston assembly design or piston seal which overcomes leaking, wear or attrition in a very hot environment.

[0011] There exists, therefore, a need in the injection molding art for a mechanically actuated valve gated system which is self-cooling and space efficient.

SUMMARY OF THE INVENTION

[0012] The primary object of this invention is to provide a space efficient mechanically actuated valve gated system.

[0013] Another object of this invention is to provide a mechanically actuated valve gated system which is self-cooling so as to reduce wear of heat sensitive parts.

[0014] Yet another object of this invention is to provide a mechanically actuated valve gated system which functions to alleviate weld lines.

[0015] Still another object of this invention is to provide a mechanically actuated self-cooling valve gated system having a motive means coaxially positioned relative the nozzle housing for acquiring a space efficient design.

[0016] And still another object of this invention is to provide a valve gated system which is particularly useful for stack mold arrangements due to the space efficient design thereof.

[0017] The foregoing objects are obtained by the inventive hot runner valve gated system of the present invention which is characterized by the features of claim 1.

[0018] Preferred embodiments of the present invention are subject of dependent claims.

[0019] In one embodiment of the invention, the piston is substantially cylindrical having a wall with an inner diameter adjacent the nozzle housing. The wall includes an opening therein adapted to engage a stop for terminating the piston stroke. In the same embodiment, and during the opening of the valve system, the piston stroke is of a distance which substantially removes the valve stem from the flow path of the molding material such that weld lines are not formed. This embodiment also includes means for creating a seal between the piston and the manifold plate, wherein the means for cooling is also adapted to cool the means for creating a seal.

[0020] The details of the present invention are set out in the following description and drawings wherein like reference characters depict like elements.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] FIG. 1 is an overhead and cross-sectional view of the valve gated system of the present invention.

[0022] FIG. 2 is a cross-sectional view taken through line 2-2 of FIG. 1.

[0023] FIG. 3 is an overhead and cross-sectional view of the valve gated system of the present invention shown in the open position.

[0024] FIG. 4 is an overhead and cross-sectional view of the valve gated system of the present invention used in a stack mold arrangement.

[0025] FIG. 5 is an overhead, cross-sectional and cutaway view of another embodiment for cooling the valve gated system of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0026] Referring now to the drawings in detail, there is shown in FIG. 1 an overhead cross-sectional view of the hot runner gate valve system of the present invention, designated generally as 10. The valve gated system 10 generally includes a valve stem 12, a sleeve 13, a cylindrical piston 14 and a nozzle housing 16. System 10 is adapted to be positioned within a mold plate, as manifold plate 18, sandwiched between manifold backup plate 20 and mold plate 22.

[0027] Manifold plate 18 includes a bore 24 therein for receiving valve gated system 10 of the present invention. Bore 24 has a diameter for slidably engaging the outer surface of cylindrical piston 14. The inner surface of cylindrical piston 14 slidably engages the outer surface of cylindrical sleeve 13, and nozzle housing 16 is positioned coaxially within sleeve 13. Nozzle housing 16 extends outwardly from surface 26 of manifold plate 18 adjacent mold plate 22, extending partially into mold plate 22.

[0028] Referring to FIGS. 1 and 2, nozzle housing 16 is essentially an elongated rod shaped member having a base portion 23 adapted to be fastened inside manifold plate 18. Nozzle housing 16 may desirably be a one piece cast part, but may also if desired by of more than one piece. Nozzle housing 16 includes at least one channel 28, preferably two as shown in FIG. 2, extending therethrough and in communication with melt flow channel 30 located in hot runner manifold 31. Channel 28 extends substantially the length of nozzle housing 16 and converges with channel 32, which runs longitudinally in nozzle housing 16, and guides valve stem 12. Channel 28 and valve stem channel 32 converge toward the end of nozzle 16 adjacent mold plate 22. With valve stem 12 in the closed position as shown in FIG. 1, the end of valve stem 12 blocks the flow of molding material through channel 28 and into valve stem channel 32. However, with valve stem 12 in the retracted position as shown in FIG. 3, molding material is allowed to flow through channel 28 into valve stem channel 32 which also leads into mold plate 22. Upon closing the valve, valve stem channel 32 extends to a position relatively close to injection gate orifice 33, thereby assuring a true center location of the valve stem in the gate and avoiding undue wear caused by valve stem bending or flexing during the closing of the valve stem.

[0029] Actuation of valve stem 12 in a reciprocating manner for opening and closing the flow path of the

molding material from channel 28 into valve stem channel 32 is accomplished via the sliding movement of piston 14 against sleeve 13. Piston 14 is set into motion by the use of pressurized air directed into ports 34 and 36 which extend through mold manifold plate 18 in fluid communication with the outer surface of cylindrical piston 14. An annular space 38 is located between bore 24 and sleeve 13 for the movement therein of piston 14. However, in order to direct the fluid against the outer surface of the piston, the piston is necessarily not entirely cylindrical in shape.

[0030] The piston is essentially annular in shape, including a first and second wall thickness wherein the first wall thickness at the ends of piston 14 is substantially half the width of the annular space 38 and at the middle portion of piston 14, the wall is substantially equivalent in width to the annular space such that the central portion slidably engages bore 24. The differing widths form walls 39a and 39b on which the fluid or air can be directed. Accordingly, when pressurized air is directed into ports 34 and 36, the air is directed into the annular space not occupied by piston 14. In order to place the valve gated system in the closed position as shown in FIG. 1, air is directed into port 34 against wall 39a and in order to place the valve gated system in the open position as shown in FIG. 3, air is directed into port 36 against wall 39b.

[0031] Because the piston is of annular design, it cannot achieve the same force as a solid piston under equal air pressures, for a given outside diameter. Consequently, to achieve an equivalent force, the air pressure must be increased. Alternatively, the outside diameter of the annular piston can be increased in size to provide the equivalent force under the same air pressures used for solid pistons. Such an increase in diameter will not cause the piston to become prohibitively large or space consuming, typically requiring an increase in outside diameter of only approximately one third the diameter of a solid piston. In comparison to the prior art of the assembly of the present invention, as a whole, remains substantially more compact.

[0032] Piston 14 also includes a series of seals 40a and 40b, and 42a and 42b, wherein seals 40a and 40b are positioned between the outer surface of piston 14 and bore 24 and seals 42a and 42b are positioned between the inner surface of piston 14 and sleeve 13. The seals function to allow pressure build-up in annular space 38 on each end of piston 14 for moving the same through the annular space for opening and closing the valve gated system. Due to the construction of sleeve 13 and other cooling features discussed below, seals 40a and 40b and seals 42a and 42b can be typical O-ring seals, not requiring special materials for withstanding high temperatures.

[0033] Valve stem 12 is reciprocated through nozzle housing 16 via a mechanical attachment between piston 14 and valve stem 12. That is, a cross bar 44 extends from piston 14 inwardly through an opening 46 in sleeve 13 and into a cavity 48 in nozzle housing 16. Upon the movement of piston 14 through annular space 38, cross bar 44 is also moved through opening 46 and cavity 48 and due to the connection of bar 44 with valve stem 12, valve stem 12 is moved with the movement of piston 14. Within cavity 48, a cap 50 is attached to cross bar 44 and is adapted to engage a back wall 52 (See FIG. 1) upon a complete opening stroke of the piston, as shown in FIG. 3. Referring back to FIG. 1, piston 14 is limited to a stroke of a "A" which is essentially the size of opening 46 and the length of the space between cap 50 and back wall 52. Stroke "A" is designed at a distance such that valve stem 12 is moved substantially out of the flow stream of channel or channels 28 so that a weld seam is avoided.

[0034] Sleeve 13, coaxially positioned relative to nozzle housing 16, functions to guide piston 14 adjacent nozzle housing 16 and also functions to align nozzle housing 16 centrally within bore 24 through mold manifold plate 18. Preferably, sleeve 13 is formed from a material having low thermal conductivity properties, such as ceramic. By using a material of low thermal conductivity, heat generated in nozzle housing 16 of system 10 can be maintained confined to the nozzle housing area. That is, because the material comprising the sleeve will not conduct heat well, heat is not transferred from nozzle housing 16 to the outside area which includes piston 14, seals 40 and 42, and annular space 38. Because of this property of sleeve 13, seals 40 and 42, as discussed above, can be constructed from a material which does not have to be substantially heat resistant.

[0035] By constructing sleeve 13 from a material having low thermal conductivity, the piston seals 40 and 42 will operate at lower temperatures and perform over a longer period of time. A temperature drop of 28°C (50°F) may be sufficient to allow a the seal to operate for such an extended period. To achieve this drop, the sleeve is constructed from materials such as, for example, ceramic or titanium alloy. These materials possess a thermal conductivity of much less than 15 kcal/m hr °C (10 BTU/ft hr °F), typical of steels generally used, thereby reducing the temperature of the seals to suitable values.

[0036] During the processing of certain molding materials or plastics through the hot runner valve gated system 10 of the instant invention, minute amounts of plastic processing byproducts may make their way up the valve stem channel 32. For such a case, a drainage channel 54 has been provided which leads to a free air space such as the one between hot runner manifold 31 and manifold plate 18. At this space, the byproducts have ample room to collect before requiring a periodic clean out. In addition, the byproducts are prevented from progressing further up the valve stem bore and impeding the operation of piston 14 and bar 44.

[0037] An advantageous application of the system 10, described above, is shown in FIG. 4 for use with a stack mold design. The simplicity of this design in comparison to the prior art discussed above can be readily appreci-

ated by reviewing the figures of the present invention. The savings in space offered by the compact design of the system of the instant invention allows a stack mold to fit into tight capacities, allowing greater flexibility and efficiency on the production floor of the molder. Also, because of the reduction in distance between opposing cavity gate orifices 33 for stack molds, the novel design allows closer spacing of the molding cavities as compared to the prior art. The cavities may be spaced at a pitch slightly greater than the overall diameter of the nozzle housing assembly itself.

[0038] Another embodiment of the invention is shown in FIG. 5, wherein the means for maintaining the means for reciprocating in a cooled state include cooling channels. The cooling channels are placed between the mold manifold plate and sleeve 213. Accordingly, at various points along the length of nozzle housing 216, a coolant is introduced into a port 271 through a channel 272 and into an annular space 238 between manifold plate 218 and sleeve 213. The fluid is removed from the other side of nozzle housing 216 through channel 274. In this manner, a more direct cooling of seals 276 can be achieved.

[0039] In the embodiments described above in Figures 1-5, the system is preferably installed into manifold plate 18 from the front, i.e., the side defined by front surface 26. That is, the nozzle assembly can be inserted from surface 26 of manifold plate 18. The portion of the nozzle assembly adjacent front surface 26 may desirably be of two pieces, but may also if desired by a one piece part.

[0040] This feature provides for easier maintenance when required, as plates 18 and 20 do not have to be separated for access or removal of the nozzle assembly from the rear surface. Accordingly, with this design, the manifold can remain between the mold plates and not be disassembled.

[0041] In operation, and in order to move the gate valve system from the closed position in FIG. 1 to the open position in FIG. 3, pressurized air is introduced into port 36 against wall 39b of piston 14. The pressurized air functions to move the piston 14 through the annular space 38 until cap 50 collides with the wall 52 of cavity 48 in nozzle housing 16. At this point, valve stem 12 is retracted from gate orifice 33, as shown in FIG. 3 and molding material can be introduced through channel or channels 28 and into the end of valve stem channel 32. Accordingly, the molding material is directed into valve gate orifice 33 and into the mold. Because the molding material must flow smoothly through channel or channels 28 nozzle housing 16 is heated for maintaining viscosity.

[0042] Sleeve 13, constructed from the low thermal conductivity material, functions to confine that heat produced in nozzle housing 16 to the area surrounding nozzle housing 16 and does not conduct the heat outwardly to piston 14. Accordingly, seals 42a and 42b do not become warmed by the heat and have a longer life span. In addition, special and expensive seals which can withstand high temperatures do not have to be used. If along with using sleeve 13, the embodiment of FIG. 5 is used, wherein coolant is passed through cooling channels, the coolant is circulated through the channels during and prior to the introduction of the molding material into the nozzle housing for maintaining the piston and seals at a relatively cool temperature.

[0043] The primary advantage of this invention is that a space efficient mechanically actuated valve gated system is provided. Another advantage of this invention is that a mechanically actuated valve gated system is provided which is designed for being self-cooling so as to reduce wear of heat sensitive parts. Yet another advantage of this invention is that a mechanically actuated valve gated system is provided which functions to alleviate weld lines. Yet another advantage of this invention is that a mechanically actuated valve gated system is provided having a motive means coaxially positioned with the nozzle housing for acquiring a space efficient design. And still another advantage of this invention is that a valve gated system is provided which is particularly useful for stack mold arrangements due to the space efficient design of the system.

[0044] It is apparent that there has been provided in accordance with this invention a improved gate valve which fully satisfies the objects, means, and advantages set forth hereinbefore. While the invention has been described in combination with specific embodiments thereof, it is evident that many alternatives, modifications, and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications, and variations as fall within the scope of the appended claims.

Claims

1. A hot runner valve gated system which directs melt from a melt channel to a mold cavity, comprising:

    - at least one housing (16) adapted to be positioned in a manifold plate (18), the housing including a gate orifice (33) adapted to be positioned adjacent the mold cavity and a channel means (28) extending therethrough and in communication with said melt channel (30) for directing melt to the orifice;
    - a reciprocal valve stem (12) positioned within the housing (16);
    - means (14) for reciprocating the valve stem (12) positioned adjacent the housing for opening and closing the gate orifice (33); and
    - means for maintaining the means for reciprocating in a state of reduced operating temperature, said means for maintaining including a sleeve (13) adjacent the means for reciprocating, wherein said housing (16) is positioned co-

axially within said sleeve (13), characterized in that said sleeve (13) has at least one opening (46) or recess therein and an attachment (44) is included between the means (14) for reciprocating and the valve stem (12) extending through said opening (46) or recess in the sleeve (13).

2. The hot runner valve gated system according to claim 1, wherein the means for reciprocating comprises a piston (14) adapted to be driven through a stroke by a compressed fluid, the piston being positioned coaxially relative to the housing (16).

3. The hot runner valve gated system according to claim 2, wherein the piston (14) includes a first surface adjacent the housing (16) and a second surface adapted to be positioned adjacent the manifold plate (18).

4. The hot runner valve gated system according to claim 3, wherein a seal is formed between the piston (14) and the means (13) for maintaining and a seal is adapted to be formed between the piston (14) and the manifold plate (18).

5. The hot runner valve gated system according to one of the claims 2 to 4, wherein the piston (14) includes means for stopping adapted to cooperate with the housing (16) for terminating the stroke.

6. The hot runner valve gated system according to claim 5, wherein the piston (14) is substantially cylindrical having an inner surface adjacent the housing and the housing (16) includes a cavity (48) defined by a wall (52), wherein the means for stopping comprises a bar (44) extending from the piston (14) and into the cavity (48), the bar including a portion (50) adapted to engage the wall (52) for terminating the piston stroke.

7. The hot runner valve gated system according to one of the claims 2 to 6, wherein the piston stroke is sufficient in distance to substantially remove the valve stem (12) from the flow path of the melt such that weld lines are not formed.

8. The hot runner valve gated system according to one of the claims 1 to 7, wherein the means (14) for reciprocating includes means (40a,b) for creating a seal located between the means for reciprocating and the manifold plate (218), wherein the means (213) for maintaining is also adapted to cool the means (276) for creating a seal.

9. The hot runner valve gated system according to claim 8, wherein the means (42a,b) for creating a seal is further located between the means (14) for reciprocating and the means (13) for maintaining.

10. The hot runner valve gated system according to claim 9, wherein the sleeve (13) is positioned between the means (14) for reciprocating and the housing (16), the sleeve being formed from a material having a thermal conductivity of less than 15 kcal/m hr°C (10 BTU/ft hr °F) such that a substantial amount of the heat from the housing is not conducted through the sleeve and is substantially separated from the means (40a,b;42a,b) for creating a seal.

11. The hot runner valve gated system according to claim 10, wherein the sleeve material is ceramic or a titanium alloy.

12. The hot runner valve gated system according to one of the claims 2 to 11, wherein the means (13) for maintaining further comprises an air space (38) positioned between the piston (14) and the housing (16).

13. The hot runner valve gated system according to one of the claims 1 to 12, comprising two sets of elements, each set including a housing (16), reciprocal valve stem (12), means (14) for reciprocating and means (13) for maintaining, wherein the two sets are positioned opposite each other in a stack mold arrangement and share a common melt channel.

14. The hot runner valve gated system according to one of the claims 1 to 13, wherein the manifold plate (18) includes a rear surface adjacent a manifold (31) and a front surface (26), the housing (16) and the means (13) for maintaining adapted to be positioned in the manifold plate (18) and removable from the manifold plate through the front surface (26) for allowing easy access to the housing (16), the means for maintaining, the valve stem (12) and the means (14) for reciprocating.

Patentansprüche

1. Ventilgesteuertes Heisskanalsystem, welches Schmelze aus einem Schmelzekanal in einen Formhohlraum leitet, umfassend:

- wenigstens ein zur Anordnung in einer Verteilerplatte (18) angepasstes Gehäuse (16), wobei das Gehäuse eine Angussöffnung (33) umfasst, die angepasst ist, um an den Formhohlraum angrenzend angeordnet zu werden, und ein sich durch dieses erstreckendes und mit jenem Schmelzekanal (30) für die Leitung der Schmelze zur Öffnung in Verbindung stehendes Kanalmittel (28);
- einen innerhalb des Gehäuses (16) angeord-

neten, hin- und herbewegbaren Ventilschaft (12);

- Mittel (14) für die Hin- und Herbewegung der an das Gehäuse angrenzend angeordneten Kolbenstange (12) zum Öffnen und Schliessen der Angussöffnung (33); und
- Mittel zum Halten der Mittel für die Hin- und Herbewegung in einem Zustand verminderter Betriebstemperatur, wobei jene Mittel zum Halten eine an die Mittel für die Hin- und Herbewegung angrenzende Buchse (13) umfassen, wobei jenes Gehäuse (16) koaxial innerhalb jener Buchse (13) angeordnet ist, dadurch gekennzeichnet, dass jene Buchse (13) wenigstens eine Öffnung (36) oder einen Rückschnitt aufweist, und ein Zusatzteil (44) zwischen dem Mittel (14) für die Hin- und Herbewegung und des Ventilschaftes (12) umfasst, welches sich durch jene Öffnung (46) oder in jenen Rückschnitt in der Buchse (13) erstreckt.

2. Ventilgesteuertes Heisskanalsystem nach Anspruch 1, wobei das Mittel für die Hin- und Herbewegung einen Kolben (14) umfasst, der angepasst ist, um mittels eines durch eine komprimierte Flüssigkeit erzeugten Hubes angetrieben zu werden, wobei der Kolben koaxial bezüglich des Gehäuses (16) angeordnet ist.

3. Ventilgesteuertes Heisskanalsystem nach Anspruch 2, wobei der Kolben (14) eine erste, an das Gehäuse (16) angrenzende und eine zweite an die Verteilerplatte (18) angrenzende angepasste Oberfläche umfasst.

4. Ventilgesteuertes Heisskanalsystem nach Anspruch 3, wobei eine Dichtung zwischen dem Kolben (14) und dem Mittel (13) zum Halten gebildet wird, und eine Dichtung angepasst ist, um zwischen dem Kolben (14) und der Verteilerplatte (18) gebildet zu werden.

5. Ventilgesteuertes Heisskanalsystem nach einem der Ansprüche 2 bis 4, wobei der Kolben (14) Mittel zum Begrenzen umfasst, welche zur Zusammenarbeit mit dem Gehäuse (16) zum Beenden des Hubes angepasst sind.

6. Ventilgesteuertes Heisskanalsystem nach Anspruch 5, wobei der Kolben (14) im wesentlichen zylinderförmig ist und eine innere, an das Gehäuse angrenzende Oberfläche aufweist, und das Gehäuse (16) einen durch eine Wand (52) definierten Hohlraum (48) umfasst, wobei das Mittel zum Begrenzen einen Steg (44) enthält, der sich vom Kolben (14) weg und in den Hohlraum (48) erstreckt, wobei der Steg einen Teil (50) umfasst, der zur Anlage an der Wand (52) zum Begrenzen des Kolbenhubes angepasst ist.

7. Ventilgesteuertes Heisskanalsystem nach einem der Ansprüche 2 bis 6, wobei der Kolbenhub ausreichend ist, um im wesentlichen den Ventilschaft (12) aus dem Fliessweg der Schmelze zu entfernen, so dass keine Schweisslinien gebildet werden.

8. Ventilgesteuertes Heisskanalsystem nach einem der Ansprüche 1 bis 7, wobei das Mittel (14) für die Hin- und Herbewegung Mittel (40a,b) zur Bildung einer zwischen dem Mittel für die Hin- und Herbewegung und der Verteilerplatte (218) angeordneten Dichtung umfasst, wobei das Mittel (213) zum Halten auch angepasst ist, um die Mittel (276) zur Bildung einer Dichtung zu kühlen.

9. Ventilgesteuertes Heisskanalsystem nach Anspruch 8, wobei die Mittel (42a,b) zur Bildung einer Dichtung auch zwischen dem Mittel (14) für die Hin- und Herbewegung und dem Mittel (13) zum Halten angeordnet sind.

10. Ventilgesteuertes Heisskanalsystem nach Anspruch 9, wobei die Buchse (13) zwischen dem Mittel (14) für die Hin- und Herbewegung und dem Gehäuse (16) angeordnet ist, und die Buchse aus einem Material mit einer Wärmeleitfähigkeit von weniger als 15 kcal/m hr °C (10 BTU/fr hr °F) gebildet ist, so dass eine wesentliche Menge der Wärme vom Gehäuse nicht über die Buchse übertragen wird und im wesentlichen von den Mitteln (40a,b; 42a,b) zur Bildung einer Dichtung getrennt ist.

11. Ventilgesteuertes Heisskanalsystem nach Anspruch 10, wobei das Buchsenmaterial Keramik oder eine Titanlegierung ist.

12. Ventilgesteuertes Heisskanalsystem nach einem der Ansprüche 2 bis 11, wobei das Mittel (13) zum Halten weiter einen zwischen dem Kolben (14) und dem Gehäuse (16) angeordneten Luftraum (38) umfasst.

13. Ventilgesteuertes Heisskanalsystem nach einem der Ansprüche 1 bis 12, enthaltend zwei Sätze von Elementen, jeder Satz umfassend ein Gehäuse (16), eine sich hin- und herbewegenden Ventilschaft (12), Mittel (14) für die Hin- und Herbewegung und Mittel (13) zum Halten, wobei die beiden Sätze in einer Stapelformanordnung einander gegenüber liegend angeordnet sind und einen gemeinsamen Schmelzekanal teilen.

14. Ventilgesteuertes Heisskanalsystem nach einem der Ansprüche 1 bis 13, wobei die Verteilerplatte (18) eine an einen Verteiler (31) angrenzende hintere Fläche und eine Frontfläche (26) umfasst, wo-

bei das Gehäuse (16) und das Mittel (13) zum Halten angepasst sind, um in der Verteilerplatte (18) angeordnet zu werden und aus der Verteilerplatte durch die Frontoberfläche (26) entfernbar ist, um einen einfachen Zugang zum Gehäuse (16), dem Mittel zum Halten des Ventilschaftes (12) und dem Mittel (14) für die Hin- und Herbewegung zu ermöglichen.

Revendications

1. Système de canaux chauffés à vanne d'arrêt qui dirige une masse fondue à partir d'un canal de masse fondue vers une cavité de moule, qui comprend:

   - au moins un boîtier (16) apte à être positionné dans une plaque (18) de collecteur, le boîtier incluant un orifice (33) d'obturateur apte à être positionné adjacent à la cavité de moule, et un moyen de canal (28) qui traverse le boîtier et est en communication avec ledit canal (30) de masse fondue pour diriger la masse fondue vers l'orifice;
   - une tige (12) de vanne mobile à va-et-vient positionnée à l'intérieur du boîtier (16);
   - un moyen (14) de déplacement à va-et-vient de la tige (12) de vanne, positionné adjacent au boîtier pour ouvrir et fermer l'orifice (33) de l'obturateur; et
   - un moyen destiné à maintenir dans un état de température réduite d'exploitation le moyen de déplacement à va-et-vient, ledit moyen de maintien incluant un manchon (13) adjacent au moyen de déplacement à va-et-vient, ledit boîtier (16) étant positionné de façon coaxiale à l'intérieur dudit manchon (13), caractérisé en ce qu'au moins une ouverture (46) ou un évidement est ménagé dans ledit manchon (13) et un accessoire (44), qui s'étend à travers ladite ouverture (46) ou ledit évidement dans le manchon (13), est inclus entre le moyen (14) de déplacement à va-et-vient et la tige (12) de vanne.

2. Système de canaux chauffés à vanne d'arrêt selon la revendication 1, dans lequel le moyen de déplacement à va-et-vient comprend un piston (14) apte à être entraîné par un fluide comprimé pour parcourir une course, le piston étant positionné coaxialement par rapport au boîtier (16).

3. Système de canaux chauffés à vanne d'arrêt selon la revendication 2, dans lequel le piston (14) inclut une première surface adjacente au boîtier (16) et une deuxième surface apte à être positionnée adjacente à la plaque (18) de collecteur.

4. Système de canaux chauffés à vanne d'arrêt selon la revendication 3, dans lequel un joint étanche est formé entre le piston (14) et le moyen (13) de maintien et un joint étanche est apte à être formé entre le piston (14) et la plaque (18) de collecteur.

5. Système de canaux chauffés à vanne d'arrêt selon l'une quelconque des revendications 2 à 4, dans lequel le piston (14) inclut un moyen d'arrêt apte à coopérer avec le boîtier (16) pour terminer la course.

6. Système de canaux chauffés à vanne d'arrêt selon la revendication 5, dans lequel le piston (14) est sensiblement cylindrique et comporte une surface intérieure adjacente au boîtier et le boîtier (16) inclut une cavité (48) définie par une paroi (52), le moyen d'arrêt comprenant une barre (44) qui s'étend du piston (14) pour entrer dans la cavité (48), la barre incluant une partie (50) apte à venir au contact de la paroi (52) pour terminer la course du piston.

7. Système de canaux chauffés à vanne d'arrêt selon l'une quelconque des revendications 2 à 6, dans lequel la course du piston est d'une distance suffisante pour enlever sensiblement la tige (12) de vanne hors du trajet de flux de la masse fondue de façon qu'aucune ligne de soudure n'est formée.

8. Système de canaux chauffés à vanne d'arrêt selon l'une quelconque des revendications 1 à 7, dans lequel le moyen (14) de déplacement à va-et-vient inclut un moyen (40a, b) de création d'un joint étanche situé entre le moyen de déplacement à va-et-vient et la plaque (218) de collecteur, le moyen (213) de maintien étant aussi apte à refroidir le moyen (276) de création d'un joint étanche.

9. Système de canaux chauffés à vanne d'arrêt selon la revendication 8, dans lequel le moyen (42a, b) de création d'un joint étanche est en outre situé entre le moyen (14) de déplacement à va-et-vient et le moyen (13) de maintien.

10. Système de canaux chauffés à vanne d'arrêt selon la revendication 9, dans lequel le manchon (13) est positionné entre le moyen (14) de déplacement à va-et-vient et le boîtier (16), le manchon étant formé d'une matière à conductivité thermique inférieure à 15 kcal/m heure°C (10 BTU/pied heure °F), d'une manière telle qu'une proportion sensible de la chaleur n'est pas conduite du boîtier à travers le manchon et est sensiblement séparée du moyen (40a, b; 42a, b) de création d'un joint étanche.

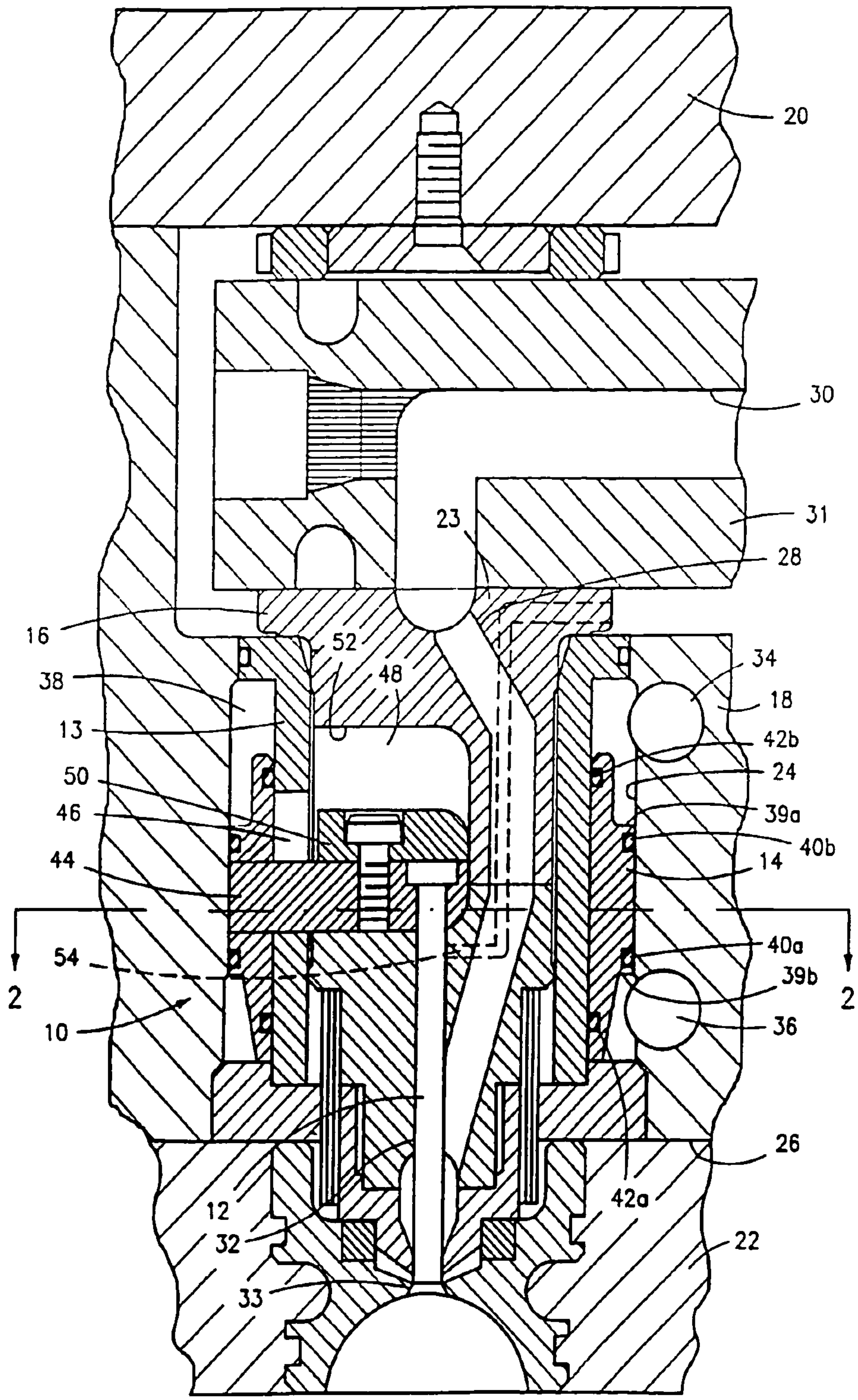
11. Système de canaux chauffés à vanne d'arrêt selon

la revendication 10, dans lequel la matière du manchon est une céramique ou un alliage de titane.

12. Système de canaux chauffés à vanne d'arrêt selon l'une quelconque des revendications 2 à 11, dans lequel le moyen (13) de maintien comprend en outre un espace d'air (38) positionné entre le piston (14) et le boîtier (16).

13. Système de canaux chauffés à vanne d'arrêt selon l'une quelconque des revendications 1 à 12, comprenant deux ensembles d'éléments, chaque ensemble incluant un boîtier (16), une tige (12) de vanne mobile à va-et-vient, un moyen (14) de déplacement à va-et-vient et un moyen (13) de maintien, dans lequel les deux ensembles sont positionnés en opposition entre eux dans un agencement de moule à empilement et partagent un canal commun de masse fondue.

14. Système de canaux chauffés à vanne d'arrêt selon l'une quelconque des revendications 1 à 13, dans lequel la plaque (18) de collecteur inclut une surface arrière adjacente à un collecteur (31) et une surface frontale (26), le boîtier (16) et le moyen (13) de maintien apte à être positionné dans la plaque (18) de collecteur et amovible de la plaque de collecteur à travers la surface frontale (26) pour permettre un accès facile au boîtier (16), le moyen de maintien, la tige (12) de vanne et le moyen (14) de déplacement à va-et-vient.


20
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16
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42b
24
50
39a
46
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39b
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42a
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22
33

FIG-1

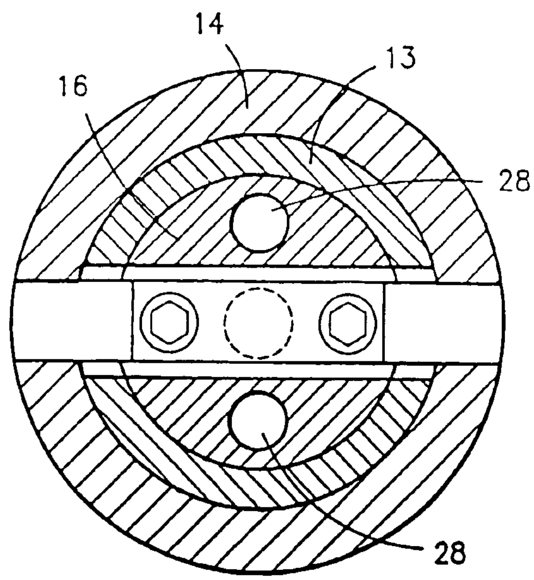

FIG-2

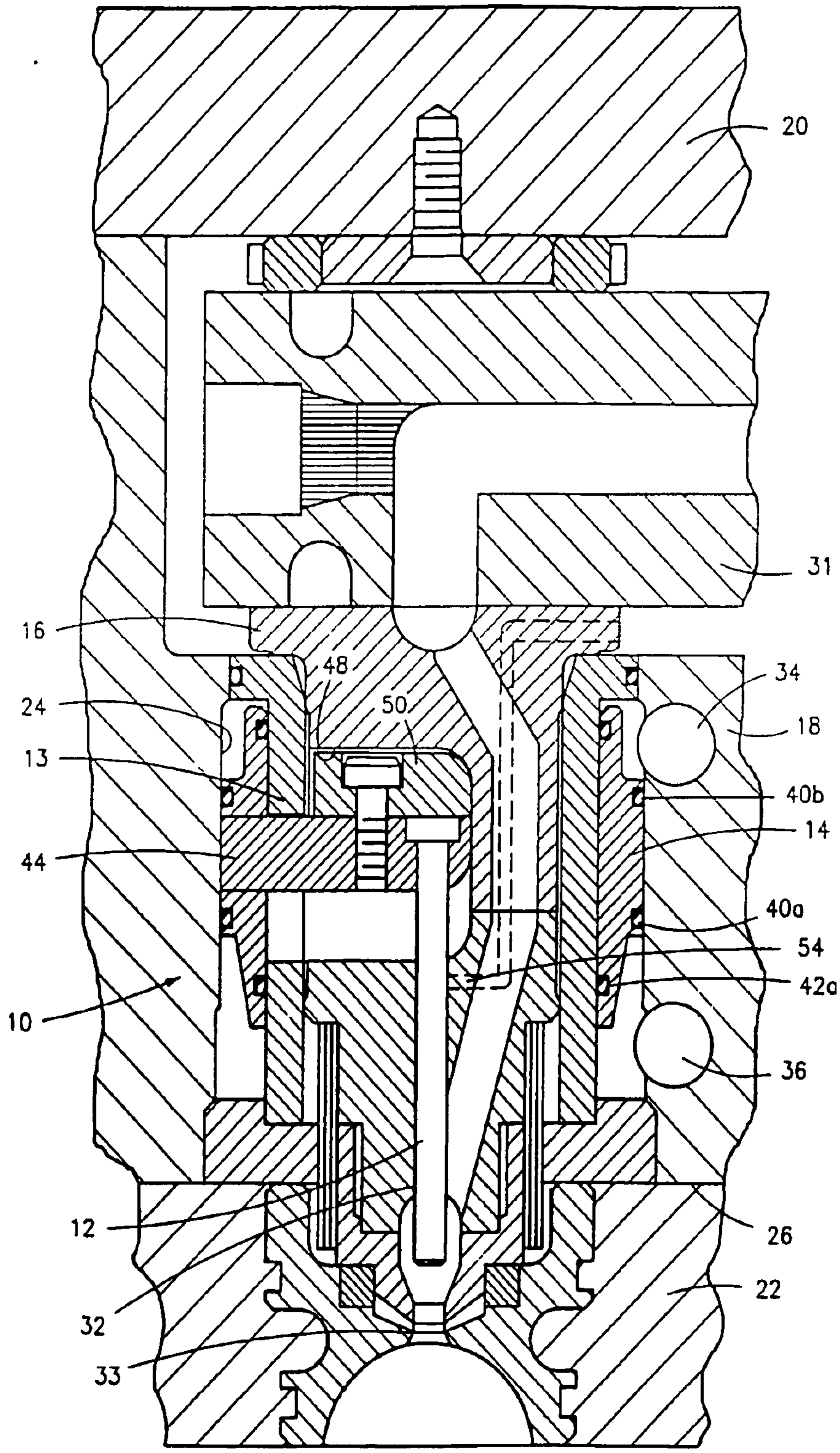

FIG-3

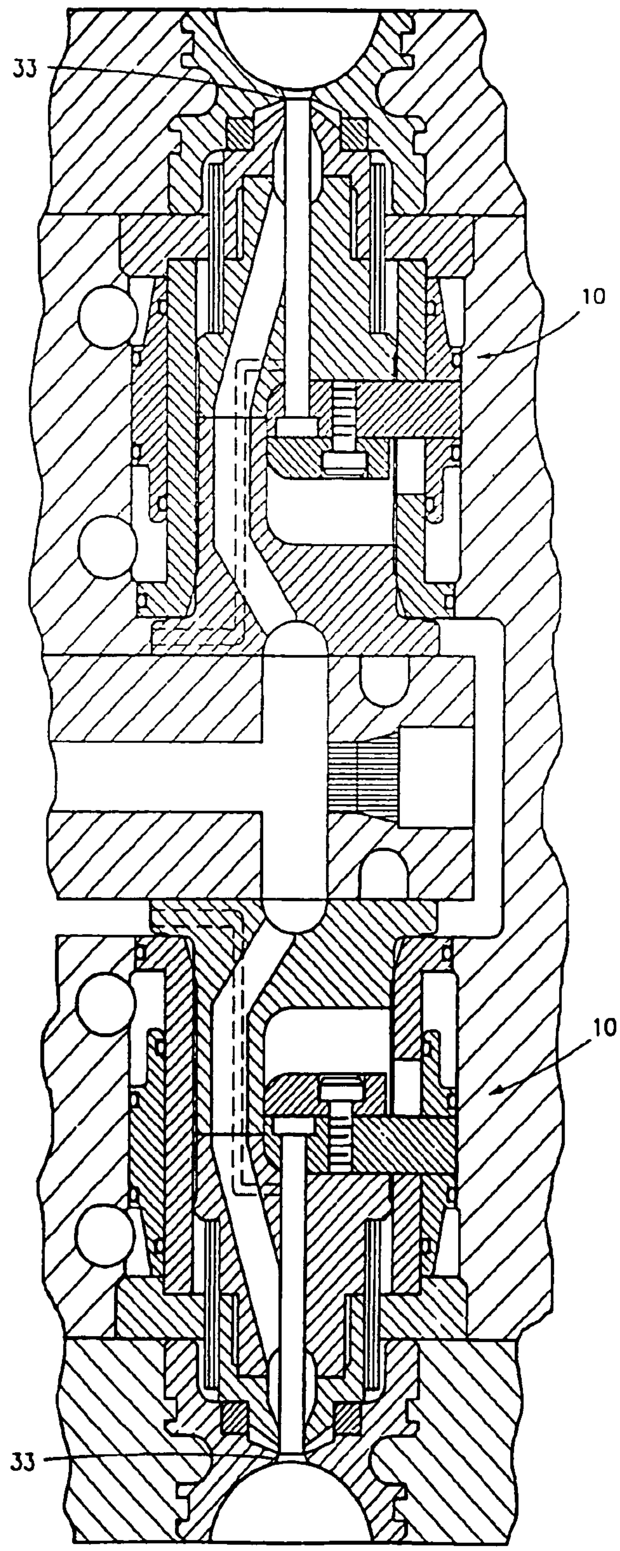

FIG-4

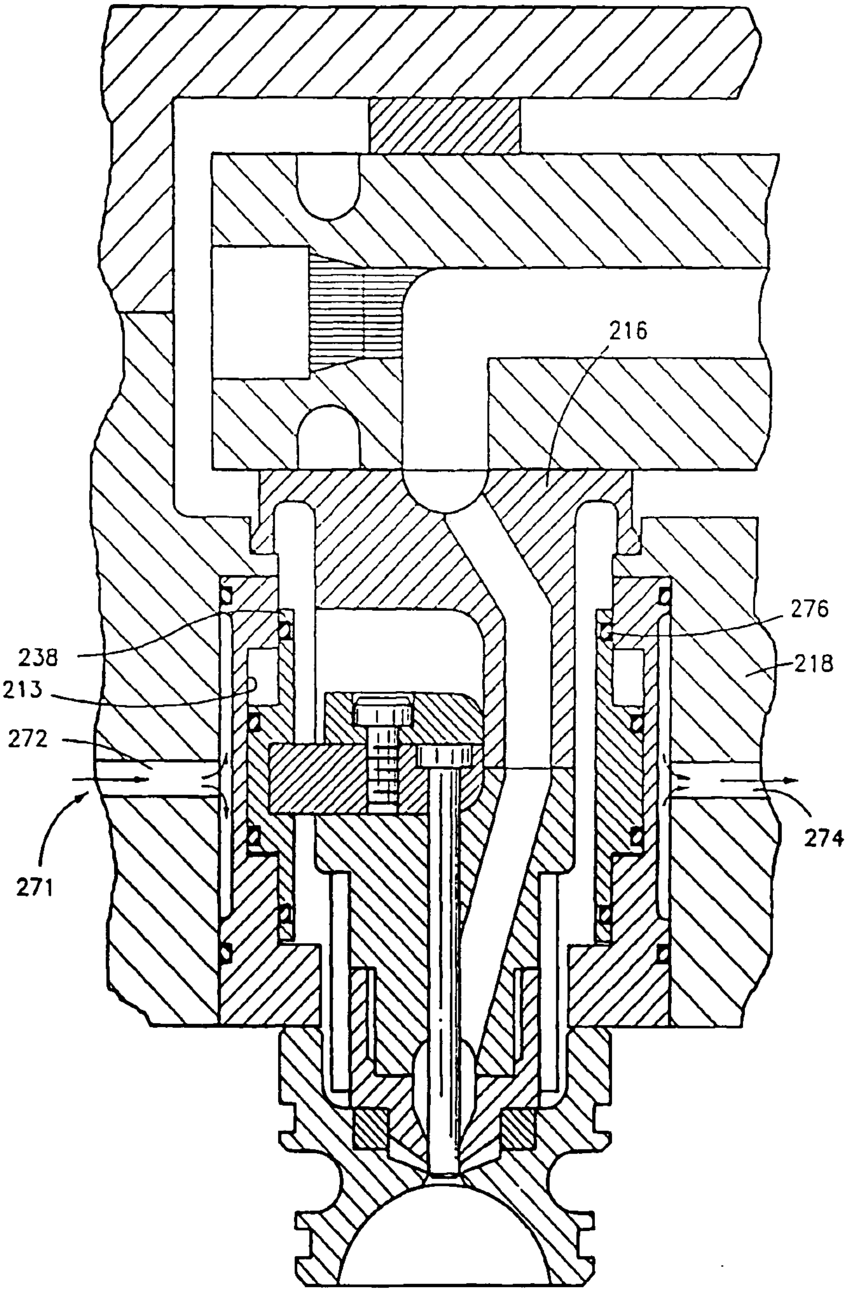

FIG-5